RESEARCH ARTICLE

Eurasian Journal of Medical and Biological Sciences
AN INTERNATIONAL JOURNAL
Eurasian J Med Biol Sci **2(1): 14-18**

A Short-Term Flow Rate Change of the Meriç River

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Received : 22/02/2022 Revised : 12/03/2022 Accepted : 16/03/2022

ABSTRACT: Meriç River (Meriç Bridge), located at the 1st km of Edirne province-Karaağaç road in our country, is one of the largest rivers originating from the Balkans. It is also the 10th largest river in Turkey. Meriç is known as a raging river. The flow rate is sometimes quite high and even damages coastal settlements. One of the most distinctive features of the Meriç River is the amount of water it carries. The amount of water carried by Meriç varies according to the season. The river, which flows very heavily during the winter months, follows a calmer course in the summer months. Flow measurements were made in the Meriç Bridge section of the Meriç River in 6 different water years (2006 - 2011) by the General Directorate of Electrical Works and Survey Administration. The readings were made daily by the General Directorate of Electrical Works Survey Administration, starting from October of the relevant year until September of the following year, that is, during a water year. In my study, the maximum currents obtained for each month by the relevant institution from these readings were used. In this study, the data of the relevant public institution was used. Considering the maximum flows read by the relevant public institution between 2006 and 2011, the flow change of the river in 5 years was examined. As a result, it was observed that the maximum flow carried by the river at 5-year intervals decreased significantly.

Keywords: Meriç river, Meriç bridge, flow rate, water year

INTRODUCTION

Although the surface of the earth is covered with water, fresh water resources make up only 2.5% of the water resources on our planet. 70% of this water is hidden in glaciers and snow masses. Water, an indispensable resource for all living things, is a vital value. Although they cover only 1% of the Earth's surface, freshwater ecosystems are home to 10% of all known animal species (WWF, 2012). Currently, almost one-fifth of the world's population live in water-stressed areas, with this rate expected to rise to two-thirds by 2025 (Faures et al., 2007). Climate change is sudden, severe and significant changes that occur in long-term weather events and is felt more intensely today due to the increase in human-induced activities. According to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), most of the warming in the atmosphere since the middle of the 20th century is in greenhouse gas concentrations due to human activities was due to the observed increase (IPCC, 2014). As a result, the global temperature has increased by about 0.8°C in the last 150 years and continues to rise. Due to increased greenhouse gas emissions, global warming has led to changes in the distribution of water resources in many parts of the world, and global and regional hydrological cycles have been greatly affected by climate change (Brutsaert & Parlange, 1998; Solomon, et al.,2007; Hagemann, et al., 2013; Dufresne, et al., 2013). Exceeding the 2°C increase in temperatures compared to pre-industrialization increases the dangerous risks for human and natural systems on a global scale. Climate projections reveal that temperature increases will rise much higher until the end of the current century. Almost all of these projections indicate that precipitation will decrease significantly in the future in Southern Europe and the Mediterranean Basin is pointing. For this reason, in terms of evaluating the impact of climate change on the water resources of Turkey, which is located in the Southeastern Europe and Eastern Mediterranean region, it is of great importance to obtain sensitive results by realizing future projections with sophisticated models. Although climate change is primarily thought of as an increase in temperatures and global warming, the most important effects of climate change are the effects that will occur due to the change in precipitation regime. The hydrological system is directly and indirectly affected by the climatic conditions in the world. Changes in temperatures affect evapotranspiration rate, cloud characteristics, soil moisture, storm intensity, and snowfall and melting regimes.

At the same time, changes in precipitation lead to changes in the time and severity of floods and droughts, surface flow regime, amount of water seeping underground, plant pattern, and growth rates (Ragab & Prudhomme, 2002). The effect of climate change on the quality of water resources can be monitored with physico-chemical parameters, micro pollutants and biological parameters. The effect of these parameters on the quality of water resources varies according to the type of water body (river, dam, pond, etc.) and water body characteristics (residence time, size, shape, depth, etc.) (Delpla et al., 2009). The growth of the population and the increase in water-based agriculture increase the dependence on groundwater. (Gorelick and Zheng, 2015; Rodell et al., 2009; Siebert et al., 2010). The excessive use of groundwater due to recent high demand and drought has had sometimes irreversible effects on many aquifers around the world (Taylor et al., 2013). Wada et al. (2010) reported that

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groundwater overdraft has doubled in the last 50 years in arid and semi-arid regions of the world. Such a large amount of depletion threatens sustainable agricultural growth as well as environmental health. Climate change is expected to increase groundwater depletion rates by increasing irrigation water use and changing the flow rates of streams. (Alam et al., 2019; Hanson et al., 2012). The Meriç river is one of the largest rivers born in the Balkans. It is also the 10th largest river in Turkey. Meriç is known as a raging river. The flow rate is sometimes quite high and even damages coastal settlements. One of the most distinctive features of the Meriç River is the amount of water it carries. Therefore, in this study, the observation data of the Meriç river in Edirne province in 2 different water years were examined. The future of the stream and the possible effects of climate change were investigated by using the changes in the flow rates obtained from the observations. The picture below shows the Meriç river and its bridge (Figure 1).

Figure 1. *Meriç River and Bridge (AA, 2021)*

MATERIALS AND METHOD

The flow of the Meriç river, one of the largest rivers born in the Balkans, rises from time to time and even damages the settlements on the coast. In this study, the changes in water levels were investigated by using the maximum flow data in 6 different water years at the Meriç bridge location of the Meriç river. Flow rates at the relevant location were measured daily by the General Directorate of Electrical Works and Survey Administration between 2006-2011. Maximum monthly flow rates were obtained by using the flow data read for all days. Short-term level changes in the river were observed by comparing the average of the maximum flow rates between 2006-2011 (including 2006 - not including 2011) and the maximum monthly flow rates in 2011. The effects of climate change on the river have been studied at a basic level by examining the maximum flow changes. The data used are flow measurements in m3/sec. (Table 1).

In the figures given in Figure 2 and Figure 3 below, the maximum average flow rates of the Meriç River in the years 2006-2011 and the monthly maximum flow rates in 2011 were analyzed using Origin and Excel software. In the chart made in the Origin program, the black dashed line shows the monthly flow rates in the years 2006-2011, and the red dashed line shows the monthly flow rates in 2011. In the column chart made with the help of Excel, the blue columns represent the monthly flow rates in 2006-2011 and the orange columns represent the monthly flow measurements in 2011.

Table 1. *Meriç River Maximum Flow Rates*

MONTH	WATER YEAR	
	m3/sn (2006-2011)	m3/sn (2011)
OCTOBER	216,6	297
NOVEMBER	439	354
DECEMBER	389,6	307
JANUARY	413,6	329
FEBRUARY	548,6	352
MARCH	650,2	282
APRIL	423,6	195
MAY	304,6	193
JUNE	234,8	133
JULY	222	108
AUGUST	170,7	105
SEPTEMBER	193,4	91,8

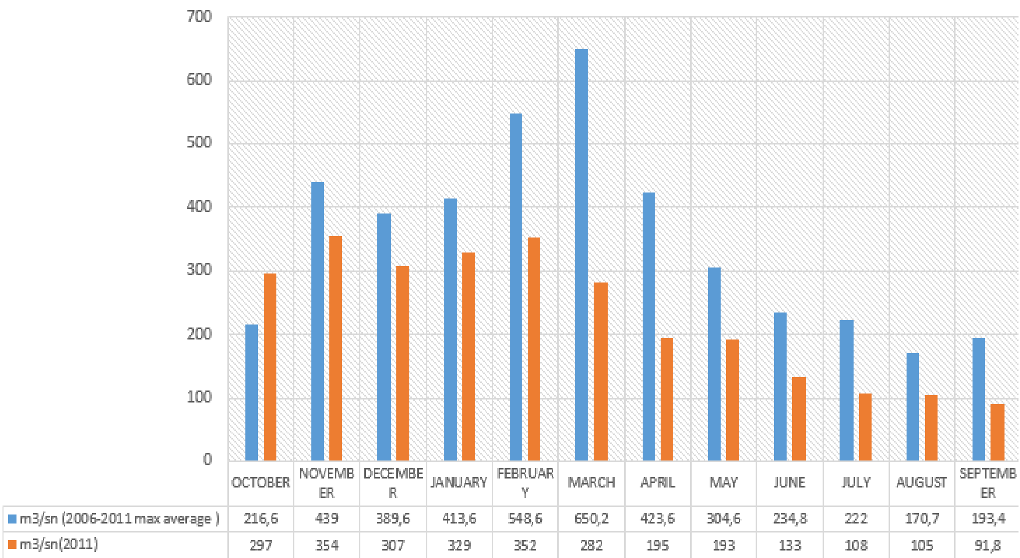
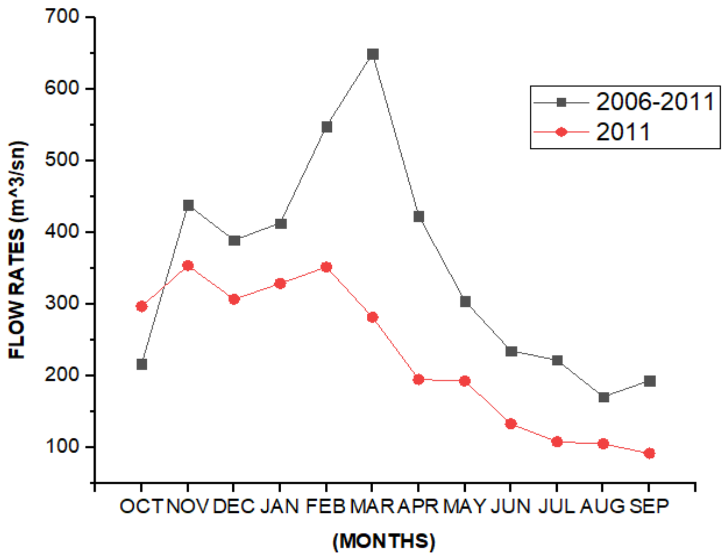


Figure 2. *Change in Flow Rates of 2006-2011 and 2011 Water Years*



RESULTS AND DICCUSSION

It has been observed that the flow of the river changes significantly according to the season. The river flows very heavily in the winter and flows more calmly in the summer. As a result, it was observed that the maximum flow carried by the river at 5-year intervals decreased significantly. This observation clearly reflects the negative effects of climate change, albeit short-term. And it is obvious that it is essential to protect the future of the river with good planning.

CONCLUSION

As in the whole world, global warming and climate change have negative effects on water resources in our country. The pressure on the rivers, which is one of the surface water resources, increases in parallel with this. As seen in the study, even in a short period of 5 years, the flow rate of the Meriç River decreased significantly. All these point to the more efficient and careful use of rivers, which are our future.

CONFLICT OF INTEREST

No conflict of interest was declared by the authors.

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